CLAIMS:

1. An apparatus for replacing at least a portion of an intervertebral disc in a spinal column, comprising:

a first member having a first vertebral contact surface for engagement with an endplate of a first vertebral bone in the spinal column, and having a first articulation surface that is defined by a plurality of concave arcs each having a respective radius of curvature about a corresponding axis substantially perpendicular to an anterior-posterior plane of the spinal column, and a plurality of convex arcs each having a respective radius of curvature about a corresponding axis substantially perpendicular to a lateral plane of the spinal column; and

a second member having a second vertebral contact surface for engagement with an endplate of a second vertebral bone in the spinal column, and having a second articulation surface that is defined by a plurality of convex arcs each having a radius of curvature about a corresponding axis substantially perpendicular to the anterior-posterior plane of the spinal column, and a plurality of concave arcs each having a radius of curvature about a corresponding axis substantially perpendicular to the lateral plane of the spinal column, wherein:

an intervertebral disc space is defined substantially between the first and second endplates of the first and second vertebral bones, and

the radii of curvature of the first and second articulation surfaces are sized such that the first and second articulation surfaces engage one another when the first and second members are disposed in the intervertebral disc space to enable the first and second vertebral bones to articulate in at least one of flexion, extension and lateral bending.

2. The apparatus of claim 1, wherein at least one of: (i) the axes perpendicular to the anterior-posterior plane of the spinal column are substantially coaxial; and (ii) the axes perpendicular to the lateral plane of the spinal column are substantially coaxial.

3. The apparatus of claim 1, wherein at least one of: (i) the axes perpendicular to the anterior-posterior plane of the spinal column lie in a plane that is substantially perpendicular to the anterior-posterior plane; and (ii) the axes perpendicular to the lateral plane of the spinal column lie in a plane that is substantially perpendicular to the lateral plane.

4. The apparatus of claim 1, wherein:

at least one of the concave arcs of the first articulation surface has a radius of curvature A about a first axis substantially perpendicular to the anterior-posterior plane of the spinal column, and at least one of the convex arcs of the first articulation surface has a radius of curvature B about a first axis substantially perpendicular to the lateral plane of the spinal column; and

at least one of the convex arcs of the second articulation surface has a radius of curvature C about a second axis substantially perpendicular to the anterior-posterior plane of the spinal column, and at least one of the concave arcs of the second articulation surface has a radius of curvature D about a second axis substantially perpendicular to the lateral plane of the spinal column.

5. The apparatus of claim 1, wherein:

the concave arcs of the first articulation surface are of substantially the same radius of curvature, each generally about a corresponding axis substantially perpendicular to the anterior-posterior plane of the spinal column;

the convex arcs of the first articulation surface are of substantially the same radius of curvature, each generally about a corresponding axis substantially perpendicular to the lateral plane of the spinal column;

the convex arcs of the second articulation surface are of substantially the same radius of curvature, each generally about a corresponding axis substantially perpendicular to the anterior-posterior plane of the spinal column; and

the concave arcs of the second articulation surface are of substantially the same radius of curvature, each generally about a corresponding axis substantially perpendicular to the lateral plane of the spinal column.

6. The apparatus of claim 1, wherein:

the concave arcs of the first articulation surface are of differing radii of curvature, each generally about a corresponding axis substantially perpendicular to the anterior-posterior plane of the spinal column; and

the convex arcs of the second articulation surface are of differing radii of curvature, each generally about a corresponding axis substantially perpendicular to the anterior-posterior plane of the spinal column.

7. The apparatus of claim 6, wherein the convex arcs of the second articulation surface are of differing radii of curvature that correspond with the differing radii of curvature of the concave arcs of the first articulation surface.

8. The apparatus of claim 6, wherein:

the anterior-posterior plane and the lateral plane intersect along a longitudinal axis of the intervertebral disc space when the apparatus is disposed in the intervertebral disc space;

one or more of the radii of the concave arcs of the first articulation surface reduce as distances of origins of the radii from the anterior-posterior plane along the corresponding axes increase; and

one or more of the radii of the convex arcs of the second articulation surface reduce as distances of origins of the radii of the convex arcs of the second articulation surface from the anterior-posterior plane along the corresponding axes increase.

9. The apparatus of claim 8, wherein the one or more of the radii of the convex arcs of the second articulation surface reduce in correspondence with the radii of the concave arcs of the first articulation surface.

10. The apparatus of claim 6, wherein:

the convex arcs of the first articulation surface are of substantially the same radius of curvature, each generally about a corresponding axis substantially perpendicular to the lateral plane of the spinal column; and

the concave arcs of the second articulation surface are of substantially the same radius of curvature, each generally about a corresponding axis substantially perpendicular to the lateral plane of the spinal column.

11. The apparatus of claim 1, wherein:

the convex arcs of the first articulation surface are of differing radii of curvature, each generally about a corresponding axis substantially perpendicular to the lateral plane of the spinal column;

the concave arcs of the second articulation surface are of differing radii of curvature, each of the concave arcs of the second articulation surface being generally about a corresponding axis substantially perpendicular to the lateral plane of the spinal column.

12. The apparatus of claim 1, wherein the concave arcs of the second articulation surface are of differing radii of curvature that correspond with the differing radii of curvature of the convex arcs of the first articulation surface.

13. The apparatus of claim 11, wherein:

the anterior-posterior plane and the lateral plane intersect along a longitudinal axis of the intervertebral disc space when the apparatus is disposed in the intervertebral disc space;

one or more of the radii of the convex arcs of the first articulation surface reduce as distances of origins of the radii from the lateral plane along the corresponding axes increase; and

one or more of the radii of the concave arcs of the second articulation surface reduce as distances of origins of the radii of the convex arcs of the second articulation surface from the lateral plane along the corresponding axes increase.

14. The apparatus of claim 13, wherein the one or more of the radii of the concave arcs of the second articulation surface reduce in correspondence with the radii of the convex arcs of the first articulation surface.

15. The apparatus of claim 11, wherein:

the concave arcs of the first articulation surface are of substantially the same radius of curvature, each generally about a corresponding axis substantially perpendicular to the anterior-posterior plane of the spinal column; and

the convex arcs of the second articulation surface are of substantially the same radius of curvature, each generally about a corresponding axis substantially perpendicular to the anterior-posterior plane of the spinal column.

16. The apparatus of claim 1, wherein the first and second articulation surfaces are sized and shaped to engage one another when the first and second members are disposed in the intervertebral disc space to enable the first and second vertebral bones to at least axially rotate relative to one another through a range of angles.

17. The apparatus of claim 1, wherein the first and second articulation surfaces are sized and shaped to engage one another when the first and second members are disposed in the intervertebral disc space to enable the first and second vertebral bones to axially rotate relative to one another through a range of angles without substantially displacing the first and second vertebral bones away from one another.

18. The apparatus of claim 17, wherein the first and second articulation surfaces are sized and shaped to achieve substantial point-to-point contact relative to one another when in at least some positions of flexion, extension, lateral bending, and/or axial rotation.

19. The apparatus of claim 17, wherein the range of angles is about plus/minus three degrees from a resting position.

20. The apparatus of claim 17, wherein the first and second articulation surfaces are sized and shaped such that the first and second vertebral bones are displaced away from one another at axial rotations outside the range of angles.